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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,896	04/08/2004	Richard Newcomb	APPL-001/00US	8871

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COOLEY GODWARD KRONISH LLP
3000 EL CAMINO REAL
5 PALO ALTO SQUARE
PALO ALTO, CA 94306

EXAMINER

BAND, MICHAEL A

ART UNIT	PAPER NUMBER
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1709

MAIL DATE	DELIVERY MODE
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04/30/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/820,896

Applicant(s)

NEWCOMB ET AL.

Examiner

Michael Band

Art Unit

1709

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-13 and 15-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-13 and 15-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date See Continuation Sheet.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application
- ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :9/7/2004; 11/8/2005; 8/28/2006; 5/5/2006.

DETAILED ACTION

Drawings

1. Figures 1-3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The use of the trademark "Liquidmetal" has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

Art Unit: 1709

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 7 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Applicant claims a bearing comprising ceramic needles. Specification does not state bearing being composed of ceramic needles, only ceramic balls.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3, 5, 9-10, and 12-13 are rejected under 35 U.S.C. 102(a) as being anticipated by Wurczinger (USPGPub 2005/0178662).

With respect to claims 1 and 13, Wurczinger '662 discloses a system for coating a substrate (p. 1, para 2) comprising a vacuum chamber (p. 1, para 19; figure 2, part 1), a rotatable tube positioned inside the vacuum chamber (figure 2, parts 1-2; p. 1, para 17), a shaft connect to the rotatable tube (figure 3, parts 2-3); a bearing positioned

Art Unit: 1709

outside the vacuum chamber (figure 2, parts 16-17); a seal (figure 2, part 13) positioned between the bearing (figure 2, part 16) and the vacuum chamber (figure 2, part 1); and a power coupler configured to deliver power to rotatable tube (p. 1, para 17-18), the power coupler (figure 2, part 18) positioned between the bearings (figure 2, part 17) and the seal (figure 2, part 13).

Wurczinger '662 depicts figure 3 having an inner body (part 25) of the target tube with cooling conduit inflow (part 4) and outflow (part 5) running through the inner body according to figure 4.

With respect to claim 3, Wurczinger '662 further discloses the system comprising the rotatable tube and shaft are integrated (figure 1, parts 2-3).

With respect to claim 5, Wurczinger '662 further discloses the system comprising a drive system (figure 2, part 18) configured to rotate the shaft (figure 2, part 3) (p. 1, para 17).

With respect to claim 9, Wurczinger '662 further discloses the system wherein the power coupler is positioned outside the vacuum chamber (figure 2, parts 1 and 9).

With respect to claim 10, Wurczinger '662 further discloses the system wherein the power coupler comprises a water-cooled slip (figure 2, part 9 and 23; figure 3, part 4).

With respect to claim 12, Wurczinger '662 further discloses the system comprising a support positioned inside the vacuum chamber, wherein the rotatable tube is continually supported by the support (figure 3, parts 1-2, 10, and 39; p. 2, para 20).

Art Unit: 1709

7. Claims 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Toki (Japanese Patent No. 01305523).

With respect to claim 19, Toki '523 teaches a bearing for pivoting an electrode (i.e. cathode/target) rotating in vacuum to provide conduction of high frequency power supply to the electrode (i.e. cathode/target) (abstract). Toki '523 also discusses an electrically conductive liquid used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki '523 further states that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector.

With respect to claim 20, Toki '523 further teaches the mercury (i.e. liquid-metal) connector is filled in the bearing case (i.e. shaft) that contains a bearing for pivoting an electrode (i.e. cathode/target) rotating (i.e. rotatable tube) (abstract). Mercury has a known resistivity of approximately $9.58 \times 10^{-7} \Omega \text{m}$. Therefore, the mercury will automatically limit the current at a certain point due to inherent properties.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1709

9. Claims 2, 6, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) as applied to claims 1 and 13 above, and further in view of Barret (US Patent No. 6,736,948).

With respect to claims 2 and 15, the reference is cited as discussed for claims 1 and 13. However Wurczinger '662 is limited in that while it does disclose transferring power into and out of the vacuum chamber (p. 1, para 18), Wurczinger '662 does not state whether a power coupler is placed outside or inside the vacuum chamber.

Barrett '948 teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett '948 further teaches transferring electrical power to and from a rotating target at the high levels required (col. 2, lines 14-16). In order to sputter effectively the targets must be in a vacuum environment as is well known in the art and exemplified in Barrett '948 (col. 11, lines 32-34). Therefore the power coupler is inside the vacuum chamber. By transferring the electrical power within the device to rotating components, the undesirable effects of heat generation are better controlled and minimized at dynamic locations (col. 4, lines 6-9).

It would have been obvious to one of ordinary skill in the art to place the power coupler inside the vacuum chamber as taught in Barrett '948 for the apparatus in Wurczinger '662 in order to gain the advantages of increased control and minimization of negative heat generation characteristics and one of ordinary skill would have a reasonable expectation of success in making such a modification.

With respect to claim 6, Wurczinger '662 is limited in that while it discloses using bearings on the shaft (figure 2, parts 3 and 16-17; figure 1, part 3), Wurczinger '662 does not describe the material composition of the bearings.

Barrett '948 further teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett '948 also teaches a bearing (part 334) being "a full ceramic bearing" (col. 8, line 33) since "ceramic material has the advantage of being non-conductive, which means it will not heat up due to AC induction resulting from the current flow" (col. 8, lines 34-36).

It would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett '948 for the bearings in Wurczinger '662 in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow and one of ordinary skill would have a reasonable expectation of success in making such a modification.

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) as applied to claim 1 above, and further in view of Needham (US Patent No. 4,115,283).

With respect to claim 7, the reference is cited as discussed for claim 1. However Wurczinger '662 is limited in that while it discusses using bearings on the shaft, Wurczinger '662 does not disclose the bearings being comprised specifically of ceramic needles.

Needham '283 teaches bearings known for antifriction composition (i.e. will not heat due to electrical conduction) (abstract). In addition to being composed of a variety of metallic materials, the bearings comprise about 15 to 25 weight percent of ceramic fibers (i.e. needles) (col. 1, lines 56-64). Needham '283 further states that these compositions are useful in a variety of applications such as journal bearings, bushings, ball bearing cages, and a variety of fittings, washers, seals, seats, wear rings, and the like (col. 4, lines 48-52). Ceramic material is also well known to be impartial to heating effects.

It would have been obvious to one of ordinary skill in the art to use ceramic fibers taught in Needham '283 as part of the bearing composition in Wurczinger '662 in order to gain the advantage of imperviousness to heat and friction.

11. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) as applied to claim 1 above, and further in view of Tanaka (UK Patent Application No. 2,290,305).

With respect to claim 8, the reference is cited as discussed for claim 1. However Wurczinger '662 is limited in that while it discusses using bearings on a shaft for a cylindrical magnetron (abstract; figure 2, parts 3 and 16-17; figure 1, part 3), it does not disclose the type of composition for the metal or metallic material bearing.

Tanaka '305 teaches a bearing alloy for use in oxidizing atmosphere, high-temperature applications (p. 1, lines 3-5). Tanaka '305 further teaches the alloy to be composed of, by weight, about 9 to 30% chromium, 2 to 22% cobalt, 1.4 to 11% molybdenum, and nickel composing a significant portion of the remaining alloy matrix

Art Unit: 1709

(p. 1, 18-20; Table 1; Table 2). Tanaka '305 further discusses that a feature of the invention is "a combination of a bearing and a shaft, in which the bearing is formed of the bearing alloy" (p. 5, lines 5-7). Tanaka '305 discusses the advantages of using this alloy as excellent oxidation resistance and wear resistance while decreasing wear loss of the shaft for high-temperature applications (p. 5, lines 21-25).

It would have been obvious to one of ordinary skill in the art to use the bearing alloy taught in Tanaka '305 for the bearings in Wurczinger '662 in order to gain the advantages of excellent oxidation resistance and wear resistance while decreasing wear loss of the shaft for high-temperature applications.

12. Claims 11, 16, and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) and further in view of Toki (Japanese Patent No. 01305523).

With respect to claim 11, the reference is cited as discussed for claim 1. However Wurczinger '662 is limited in that while it discusses a power coupler used to transfer power into and out of the vacuum chamber (p. 1, para 18), it does not tell whether the power coupler is comprised of a liquid-metal connector.

Toki '523 teaches supplying a high frequency power to electrodes (i.e. target), by a structure wherein a bearing case, which supports an electrode (i.e. cathode/target) to be rotated (i.e. cylindrical magnetron) in a vacuum vessel (abstract). An electrically conductive liquid is used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki '523 further teaches that mercury is used to electrically connect the electrode and the case, thus making the

Art Unit: 1709

mercury a liquid-metal connector. The advantage to using a mercury connector is power can be supplied to the electrode without being affected by abrasion of the bearing mechanism (abstract).

It would have been obvious to one of ordinary skill in the art to use the mercury connector taught in Toki '523 as the power coupler in Wurczinger '662 in order to gain the advantage of decreased resistivity, and thus decrease in loss of power, between the bearing and the cathode and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 16, Wurczinger '662 further discloses a system for coating a substrate (p. 1, para 2) comprising a vacuum chamber (p. 1, para 19; figure 2, part 1), a rotatable tube positioned inside the vacuum chamber (figure 2, parts 1-2; p. 1, para 17), a shaft connected to the rotatable tube (figure 3, parts 2-3); a bearing positioned outside the vacuum chamber (figure 2, parts 16-17); a seal (figure 2, part 13) positioned between the bearing (figure 2, part 16) and the vacuum chamber (figure 2, part 1); and a power coupler configured to deliver power to rotatable tube (p. 1, para 17-18), the power coupler (figure 2, part 18) positioned between the bearings (figure 2, part 17) and the seal (figure 2, part 13).

However Wurczinger '662 is limited in that while it discusses a power coupler used to transfer power into and out of the vacuum chamber (p. 1, para 18), it does not tell whether the power coupler is comprised of a liquid-metal connector.

Toki '523 further teaches supplying a high frequency power to electrodes (i.e. target), by a structure wherein a bearing case, which supports an electrode (i.e.

Art Unit: 1709

cathode/target) to be rotated (i.e. rotatable tube) in a vacuum vessel (abstract). An electrically conductive liquid is used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki '523 further teaches that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. The advantage to using a mercury connector is power can be supplied to the electrode without being affected by abrasion of the bearing mechanism (i.e. shaft) (abstract).

It would have been obvious to one of ordinary skill in the art to use the mercury connector taught in Toki '523 as the power coupler in Wurczinger '662 in order to gain the advantage of decreased resistivity, and thus loss of power, between the bearing and the cathode and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 18, Toki '523 further teaches the mercury (i.e. liquid-metal) connector is filled in the bearing case (i.e. shaft) that contains a bearing for pivoting an electrode rotating (i.e. rotatable tube) (abstract).

13. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) and Toki (Japanese Patent No. 01305523) as applied to claim 16 above, and further in view of Barret (US Patent No. 6,736,948).

With respect to claim 17, the references are cited as discussed for claim 16. However Wurczinger '662 and Toki '523 are limited in that while both discuss using a bearing to connect the shaft to the vacuum and to provide rotation (Wurczinger; figure 2,

Art Unit: 1709

parts 16-17; p. 1, para 18) (Toki; abstract), neither discusses the composition of the bearing.

Barrett '948 further teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett '948 also teaches a bearing (part 334) being "a full ceramic bearing" (col. 8, line 33) since "ceramic material has the advantage of being non-conductive, which means it will not heat up due to AC induction resulting from the current flow" (col. 8, lines 34-36). Ceramic is well known to be an inorganic, non-metallic material.

It would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett '948 for the bearings in modified Wurczinger '662 in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. USPGPub 2004/0149576 as related to the state of the art.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

Art Unit: 1709

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

16. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB



ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER